

**CLAIMS****What is claimed is:**

1. A method for a systematic approach to forming experimental designs for large, complex systems, the method comprising:

- 5 (a) generating and developing an idea for a product;  
 (b) develop an experimental design for the product, wherein the experimental design includes:  
 (c) determining critical variables for the product;  
 (d) setting a design matrix  $U_k = 0$  and  $k = 0$ ;  
 10 (e) generating a base design matrix  $X$ ;  
 (f) running  $Y(P) = (I - B(B^T B)^{-1} B^T)[(X P)/U]A$  & Wynn's criterion, where  $P$  is a permutation matrix,  $I$  is an identity matrix,  $B$  is a blocking matrix,  $B^T$  is a transposed matrix of  $B$ , and  $A$  is a matrix composed of causal map-based coefficients; and  
 (g) creating a design matrix  $U_k$ .

- 15 2. The method of Claim 1, wherein step (b) further includes:  
 (h) setting  $k \leftarrow k + 1$ ;  
 (i) running an algorithm to choose the best of random column permutations matrices  $P$ ;  
 20 (j) running an algorithm to choose the best column permutation matrix  $P$  that is near a previous solution; and  
 (k) setting  $U_k \leftarrow [X P^k \text{ with rows from } U_{k-1} \text{ appended}]$ .

3. The method of Claim 2, wherein step (b) further includes:  
 25 (l) determining whether the design  $U_k$  is at desired size; and  
 (m) if the design  $U_k$  is not at the desired size repeating steps (h) through (m) until step (l) indicates that the design  $U_k$  is at the desired size.

4. The method of Claim 2 wherein step (b) further includes (n) setting the  
 30 experimental design using  $U_k$  if step (l) indicates that the design  $U_k$  is at the desired size.

5. The method of Claim 4 further including:  
 (o) manufacturing prototype wafers using the experimental design  $U_k$ ;  
 (p) determining model responses from the prototype wafers;

(q) determining whether the model responses are adequate; and  
(r) if the model responses are not adequate repeating steps (f) through (r) until step (q) indicates that the model responses are adequate.

5           6. The method of Claim 5 further comprising:

(s) assess and propose manufacturing tolerances for the design  $U_k$ ;  
(t) determine if the proposed manufacturing tolerances are manufacturable; and  
(u) if the manufacturing tolerances are not manufacturable repeating steps (b) through (t) until it is determined that the manufacturing tolerances are manufacturable.

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7. The method of Claim 6 further comprising (v) sending the design  $U_k$  to production if it is determined that the manufacturing tolerances are manufacturable.

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8. The method of Claim 7 wherein step (e) includes:

(w) creating a causal network diagram using information determined in step (c);  
(x) creating an internode link-count distance matrix using information from step

(w);

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(y) creating a causal map using information from step (x);  
(z) identifying response nodes from the causal map created in step (y); and  
(aa) calculating map-based coefficients from the information in the causal map.

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